

Colville National Forest – 2019 – Land Management Plan

Soil Resource Supplement

Updating of Existing Soil Resource Reports from 1988 Colville National Forest – Land and Resource Management Forest Plan to 2019 Colville National Forest – Land Management Plan

and

Updated Standard Practices and Design Elements

May 22, 2020

Purpose of the Document:

The purpose of this document is to review completed Soil Resource Reports for large vegetation management projects and determine consistency with the new 2019 Colville National Forest – Land Management Plan. This report documents the consistency review between the 1988 Colville Forest Plan and the 2019 Colville Forest Plan. This supplement incorporates the LMP by reference and is tiered to the Land Management Plan's Final Environmental Impact Statement (USDA Forest Service 2019).

Review of Existing Documents for Large Scale Vegetation Management Projects:

Sweet-Ione – No additional analysis or documentation is required.

Bulldog – No additional analysis or documentation is required.

Sanpoil – No additional analysis or documentation is required.

Changes to Documents/Analysis:

After a review of the 2019 Land Management Plan and the above detailed Soil Resource Reports, it is my professional judgement that no additional analysis or substantial changes to the reports are required. The current reports detail effects to a majority of the desired conditions outline in the 2019 Land Management Plan. There is no section or requirements that radically change the manner or methods for implementation or monitoring for the Soil Resource. Additional analysis or documentation would not provide the line officer with information that would substantially change decision making or add value to that process.

Updated Standard Practices and Design Elements:

- With additional data and monitoring since the creation of these reports, standard practices for tether assisted steep slope machines have been added in Appendix I – skid trail spacing, slope limitations, and recommendation to conform to Washington State Department of Labor and Industries Technical Report.
- Added Forest Plan Standard –FW-STD-SOIL-01 – more specific details of ground cover percentages broken up by erosion hazard classes have been included, previously a generic 35% to 50% ground cover was recommended to prevent detrimental erosion.

- Added Forest Plan Guideline – FW-GDL-01 – native topsoil should be used where practical to meet restoration project objectives.

Unit Specific Design Elements have not changed. Units identified in the reports are still valid.

Total Soil Resource Commitment:

These projects do not move the Colville National Forest over the 5% Total Soil Resource Commitment Guideline (FW-GW-SOIL-01). There is a small increase due to the utilization of gravel pits on Forest Service land for road maintenance and reconstruction. Road obliteration and repair will move soil back into productivity and ecological function. The Colville National Forest is currently at approximate 2% Total Soil Resource Commitment; none of the large vegetation management project substantially alter that amount.

Determination:

The Soil Resource reports for the Sweet-Ione, Bulldog, and Sanpoil Vegetation Management Projects, have been reviewed for consistency and accuracy with the Colville National Forest – Land Management Plan 2019. All analysis and recommendations contained in those reports does not change and covers the relevant desired conditions, objectives, standards, and guidelines covered in the Colville National Forest – Land Management Plan. The soil reports inform the decision making on the relevant and important effects to soils and consequences of the no action and action alternatives.

Please include this supplement report in the project file and use the updated standard practices and design elements for the development of the environmental assessment, decision memo, and implementation of the project.

Signed:



Jason Jimenez
Soil Scientist
Colville National Forest
ARCPACS - Certified Professional Soil Scientist No. 37184

APPENDIX I

Updated Standard Practices and Design Elements for Large Scale Vegetation Management Projects

1.0 – Standard Practices

- The total acreage of all detrimental soil conditions should not exceed 20% of the total acreage within the activity area including landings and system roads (FW-DC-SOIL-01/02). The desired outcome is to limit detrimental soil conditions to preserve soil productivity and comply with Region 6 Soil Quality Standards and Guidelines – 2520.98.1 (SQS) and move towards the desired conditions for soils outlines in the Colville National Forest Land Management Plan – 2019 (LMP).
- Skid trail spacing shall be specified in the timber sale/stewardship contract as follows (FW-DC-SOIL-01/02).
 - Skid Trail Spacing: 100 feet apart edge to edge, except when converging at landings or avoiding obstacles – feller-bunchers are allowed limited passes off trail
 - Forwarder Trails: 50 feet apart edge to edge except when converging at landings or avoiding obstacles. Four to eight inches of compacted slash should cover forwarder trails – harvesters are allowed limited passes off trail
 - Tethered Assisted Steep Slope Machine Cutting/Bunching: 40 to 50 feet apart edge to edge (depending on the capability of the machine), except when converging at landings or avoiding obstacles.
- Skidding equipment shall travel on designated trails. When feasible re-use old skid trails. Feller-bunchers and forwarders should concentrate use on skid trails/forwarder trails and should travel in an efficient manner with limited passes off trails. (FW-DC-SOIL-01) The desired outcome is to limit detrimental soil conditions to preserve soil productivity and comply with SQS and LMP.
- Slope limitations for ground based equipment as follows. The desired outcome is to limit detrimental soil conditions to preserve soil productivity and reduce erosion potential.(FW-DC-SOIL-01/02 and FW-STD-SOIL-01)
 - Rubber tired skidders should be limited to slopes less than 35%. Short slope lengths may be steeper, at the discretion of sale administrators. Adverse skidding with rubber tired skidders is limited to slopes less than 20%.
 - Feller bunchers, harvester-forwarder systems, and other tracked heavy equipment should be limited to slopes less than 45%. Short slope lengths may be steeper.
 - Tethered assisted steep slope machines (SSM) should be limited to slopes less than 70%. SSM should be tethered on slopes greater than 45% and use adequate cable tension. Tethered equipment shall remain on the designated trails. SSM equipment and practices should conform to Washington State Department of Labor and Industries Technical Report Number 98-02-2019.

Treatment units where SSMs will be used for implementation should be evaluated for geologic instability. At this time there shall be no tethering of rubber tired skidders due to the lack of soil disturbance monitoring information for that logging system.

- Minimize compaction, rutting, and erosion by avoiding activities during wet conditions. Ground based equipment would operate on relatively dry soils of high soil strength or bearing capacity. Rutting exceeding soil quality standards should be remediated. The Field Guide to Soil Moisture Conditions Relative to Operability of Logging Equipment (Rust, 2005) should be used to determine soil trafficability. (FW-DC-SOIL-01/02) The desired outcome is to limit detrimental soil conditions and comply SQS and LMP.

- Required winter conditions shall have skid trails buffered by at least 8 inches of compacted snow or frozen ground or a combination of the two that exceeds 8 inches. If cut to length equipment is to be used, a combination of compacted slash, compacted snow, and/or frozen ground that exceed 8 inches can be used to buffer forwarder trails. (FW-DC-SOIL-01/02) The desired outcome is to limit detrimental compaction and rutting to preserve soil productivity and soil quality.
- Decompact landings and temporary roads to restore hydrologic function. Temporary roads should be re-contoured for their entire length. (FW-DC-SOIL-01/02/03 and FW-STD-SOIL-01) The desired outcome is to restore infiltration, provide soil cover, and stabilize soils to prevent erosion and loss of soil productivity.
- Excavated skid trails will be repaired in a manner that maintains soil hydrologic function and soil productivity. Repair should decompact the running surface of the skid trail and re-establish the contour of the slope. Soil cover will be re-established to at least 50%. Site should be evaluated for seeding and/or planting. (FW-DC-SOIL-01/02 and FW-STD-SOIL-01) The desired outcome is to re-establish soil productivity.
- In units that have had commercial harvest, keep follow up fuel treatment machinery to designated skid trails except for limited passes off designated skid trails. Fuel reduction machinery (i.e., masticators and piling equipment) should be tracked equipment having a ground pressure rating of 8 psi or less and with **an articulating arm capable of reaching at least 20 feet**. (FW-DC-SOIL-01/02 and FW-STD-SOIL-01) The desired outcome to prevent detrimental soil conditions and prevent harvest/fuel treatment units from exceeding 20% detrimental soil conditions per SQS.
- Retain fine and coarse organic matter on top of the soil. (FW-STD-SOIL-01) The desired outcome is to maintain sufficient amounts of organic matter to prevent short or long-term nutrient and carbon cycle deficits and to avoid detrimental physical and biological soil conditions. Maintain soil cover amounts to prevent soil erosion, percentages of ground cover are detailed in the below table.

Table 1. Colville National Forest LMP – FW-STD-SOIL-01- Effective Ground Cover Standard

MINIMUM PERCENT EFFECTIVE GROUND COVER POST IMPLEMENTATION OF SOIL DISTURBING ACTIVITY		
Erosion Hazard	1st Year	2nd Year
Low	20% - 30%	30% - 40%
Medium	30% - 45%	40% to 60%
High	45% - 60%	60% - 75%
Very High	60% - 75%	75% - 90%

Treatment units should be maintained with between 3 to 25 tons per acre of coarse woody material (defined for soil resources as woody material greater than 3 inches in diameter). Specific amounts are defined in FW-DC-VEG-04 and FW-DC-VEG-05. The desired outcome is to reduce soil erosion, maintain, increase soil organic matter for the long term, and promote soil productivity.

- Target machine pile size to 15 feet in diameter and 10 feet in height outside of landings. (FW-DC-SOIL-1 and FW-STD-SOIL-01) The desired outcome is to maintain sufficient amounts of organic matter and to avoid detrimental physical and biological soil conditions. Smaller piles allow for re-colonization by soil organisms and prevent excess tracking from mechanical equipment when creating piles.

- Native topsoil should be used where practical to meet restoration project objectives. (FW-GDL-SOIL-01) The desired outcome is to maintain soil productivity, reduce the potential for invasive species, and promote the regeneration of native vegetation.
- Adequately drain firelines including machine and hand line. Waterbars would be installed during fire line construction following guidelines in Fireline Waterbar Guidelines for Prescribed Fires (Jimenez, 2013a) and would be described in Elements 5 and Element 9 of the burn plan(s). (FW-DC-SOIL-02) The desired outcome is to prevent soil erosion from firelines, preserve soil organic matter, and allow for re-vegetation of firelines.

2.0 – Design Features

- For ground based units with 10% detrimental soil conditions or greater, practices would be included for some units to ensure that cumulative detrimental soil conditions would remain at or below 20%.
 - Conduct timber harvest when soil is covered by 8 inches of compacted snow or 8 inches of frozen soil or a combination of two that totals 8 inches. This condition should be present on approximately 90% of the timber harvest unit **or**
 - Conduct timber harvest using cut to length logging systems where stand density supports covering forwarder trails with 8 inches of compacted slash **or**
 - Reuse any existing skid trails, landings, and road templates.

Units where these practices should be implemented:

Ione – 11, 26, 29, 54, 55

Bulldog - 27, 78, 81, 82, 142, 164 (Review with Pre-Sale – Required CTL could be the optimal logging system)

Sanpoil – 2, 42, 56, 73, 118, 202

- Decompaction of existing soil detrimental soil condition needs to occur post implementation to keep the activity area under detrimental soil conditions as outline in SQS and to move towards desired conditions as outlined in LMP.

Units where these practices should be implemented: **None**

- For treatment units with high potential to accelerate underlying soil movement rates (decrease slope stability to the extent where landslides or debris flows are increased beyond natural rates).
 - Maintain basal area of trees to an extent where roots maintain soil stability.
 - Maintain vegetation to an extent that does not substantially increases soil water content.
 - Limit traffic of heavy equipment on identified unstable slope/landslide area.
 - Implementation staff with work with soil staff on a site specific plan for treatment.

Units where these practices should be implemented: **None**

- Landings should not be placed in areas designated as prime farm land. Soil scientist should be contacted to confirm the location of prime farmland during layout if needed.

Units where these practices should be implemented:

Ione - 9, 27

Bulldog – None

Sanpoil - None

The desired outcome is to comply with direction of the SQS and LMP and maintain soil productivity and tree growth for the long term (>100 years). (FW-SOIL-01, FW-SOIL-02, and FW-DC-SOIL-03)

APPENDIX II

Summary of Colville National Forest – Land Management Plan 2019
The Soil Resource

Summary Definitions of Different Plan Components

Desired Conditions (Goals) – maintain or make progress toward one or more desired conditions (aspirations)

Objectives – concise projections of measurable time-specific intended outcomes; expected outcomes or actions required to accomplish movement towards desired conditions.

Standards – constraints upon project and activity decision making are established to help achieve desired conditions; ensure projects and activities conform to law and regulations.

Goals – provide operational practices and procedures that are applied to project and activity decision making to help achieve objectives and desired conditions.

Soil Resource Related Sections in the 2019 Land Management Plan

SOIL (SOIL)

Soils are an integral part of ecosystems, their function, and the above and below ground interaction of organisms. These functions all contribute to ecological resilience. Soil conservation and protection is needed to effectively maintain soil quality and productivity and improve or protect watershed conditions. Generally, soil productivity standards and guidelines are not applied to administrative sites or dedicated use areas (such as roads, recreation sites).

Desired Conditions – Specific to Soil

FW-DC-SOIL-01. Soil Productivity and Function

Soil productivity and function contributes to the long-term resilience of ecosystems. Management activities occur on soils with the inherent capability to support those activities.

Table 1. Soil ecological functions with attributes and indicators for long-term soil productivity

Soil Function	Selected Attributes	Soil Quality Indicator	Desired Condition
Biological	Roots	Root growth and distribution	Root growth, both vertically and laterally, is not impeded by land management actions. Root distribution and depth is at expected levels for vegetation type and successional stage.
	Plant Community Potential and Thermodynamics	Plant Community Composition	The soil is capable of supporting a distribution of desirable plant species by vegetative layer (i.e., trees, shrubs, herbaceous) as identified in the potential plant community.
		Canopy Cover and Soil Cover	Soil temperature and moisture is maintained in conditions to support desired floral and faunal communities.
Hydrologic	Infiltration	Surface Structure	Surface structure is as expected for the site (e.g., granular, subangular blocky, single grain).
	Water Absorption and Storage	Available Water	Site water is as expected for the soil type or has been improved.

Soil Function	Selected Attributes	Soil Quality Indicator	Desired Condition
		Volcanic Ash Cap	Soil ash cap is intact and as expected for the site.
	Water Transmission	Subsurface Flow Connectivity	Maintain subsurface flow connectivity (i.e., subsurface flow is not obstructed or intercepted).
Nutrient Cycling	Organic Matter Composition	Surface Organic Matter	The amount of organic material on top of the mineral soil is maintained at levels to sustain soil microorganisms and provide for nutrient cycling. The size, amount, and distribution of organic matter maintained on the mineral soil on a long term basis is consistent with the amounts that occur given the local ecological type, climate, and normal wildland fire return interval for the area.
		Fine Woody Material	Fine woody material is on site in various stages of decay in amounts appropriate for plant association group.
Nutrient Cycling (continued)		Coarse Woody Material	See FW-DC-VEG-04 - coarse woody debris
	Nutrient Availability	Surface (A) horizon or mollic layer	The amount of organic matter within the mineral soil, indicated by the color and thickness of the upper soil horizon, is within the normal range of characteristics for the site, and is distributed normally across the area. ^{3F1}
		Nutrient Deficiency	Soil nutrients are maintained at levels to support desired vegetation.
Carbon	Carbon Storage Potential		The soil's ability to store carbon is not reduced from current levels.
Support and Stability	Stability	Surface erosion (wind, rill, or sheet)	Erosion is occurring at natural levels or not evident and an adequate level of soil cover is maintained to prevent accelerated erosion.
	Support	Site support (mass erosion, landslide prone)	Site stability potential is unchanged or stability has been improved. Soil stability varies from minor soil creep to active land flows dependent on soil characteristics, soil moisture, and triggers. Management activities avoid or do not accelerate underlying soil movement rates.
	Deposition	Soil deposition	Deposition is at natural levels and recent depositional material is vegetated.
Filtering and Buffering	Filtering	Soil contamination	The soil acts as a filter and buffer to protect the quality of water, air, and other resources by immobilizing, degrading or detoxifying chemical compounds or excess nutrients.

¹ Soil characteristics are defined by Natural Resources Conservation Service SSUGRO (Soil Survey Geographic Database) soil data layer

FW-DC-SOIL-02. Detrimental Soil Conditions

Surface erosion rates are within the natural range of variation for a given biophysical setting. There is no degradation of aquatic habitat and water quality from surface erosion rates resulting from permitted uses and management actions. Ecological and hydrologic functions are not impaired by soil compaction.

FW-DC-SOIL-03. Soil Stability

Soil stability varies from minor soil creep to active land flows dependent on soil characteristics, soil moisture, and triggers. Management activities do not accelerate underlying soil movement rates.

Objective – Specific to Soil

FW-OBJ-SOIL-01. Soil Productivity and Function

Within 5 years of plan implementation, annually stabilize, rehabilitate, or restore natural processes that support soil productivity and function on 20 to 30 acres.

Standard – Specific to Soil

FW-STD-SOIL-01. Effective Ground Cover

Minimum effective ground cover following any soil-disturbing management activity should be as shown in the following table.

Table 2. Minimum effective ground cover following any soil-disturbing activity

Minimum effective ground cover (percent)		
Erosion hazard class	1st year	2nd year
Low (very slight-slight)	20-30	30-40
Medium (moderate)	30-45	40-60
High (severe)	45-60	60-75
Very High (very severe)	60-75	75-90

(Source for erosion hazard classes: Forest Service Manual 2520)

Guidelines – Specific to Soil

FW-GDL-SOIL-01. Total Soil Resource Commitment

The Total Soil Resource Commitment is no more than 5 percent of the Forest. The soil stability and support function is maintained within the Total Soil Resource Commitment.

Total Soil Resource Commitment is the conversion of a productive site to an essentially non-productive site (0 to 40 percent of natural productivity) for a period of more than 50 years. Examples include system roads, administrative sites, developed campgrounds, rock quarries, mine sites, and livestock watering facilities².

FW-GDL-SOIL-02. Native Topsoil

Native topsoil should be used where practical to meet restoration project objectives.

² Existing condition as of December 2016 is that less than 2 percent of lands managed by the Colville National Forest is dedicated to uses other than soil/vegetation productivity.

Forest Plan Components Related to Soils but Outside the Soil Section

FW-DC-VEG-04. Snags and Coarse Woody Debris

Snags and down wood occur in sizes, amounts, and distributions to provide important wildlife habitat and contribute to ecosystem processes and services. This desired condition for snag and down wood levels applies forest wide within forested habitat types with the exception of the Administrative and Recreation Sites Management Areas. The desired conditions for snags and down wood levels is evaluated on National Forest system lands at the watershed scale (Table 7 and Table 8).

Table 7. Desired amounts and spatial arrangement of snags by forest vegetation type

Does not pertain to the soil resource.

Table 8. Desired amounts of coarse woody debris (CWD) by forest vegetation types

Forest Vegetation Type	Coarse Woody Debris ¹ (tons per acre)
Douglas-fir Dry	3-7
Northern Rocky Mountains Mixed Conifer	5-10
Western Hemlock/Western Red Cedar	25-40
Subalpine fir/Lodgepole pine	16-40
Spruce/Subalpine fir	5-12

FW-DC-VEG-05. Biological Legacies

Large trees, snags, and down wood are represented across the landscape and large tree habitat is maintained to support wildlife, aquatic and soil resources and support recovery processes in the post disturbance ecosystem.

Examples of biological legacy categories are provided in table . Not all components will be present within an individual site-specific project area.

Table 9. Biological legacy categories and examples

Biological legacy category	Examples
Organisms	Sexually mature and intact live trees
	Tree reproduction (seeding and sapling banks)
	Vegetatively reproducing parts (e.g., roots)
	Seed banks
	Shrub, herb, bryophyte species
	Mature and immature animals and microbes
Organic matter	Fine litter
	Particulate material
Organically derived structures	Downed trees and other coarse woody debris
	Root wads and pits from uprooted trees
	Hollow live trees
	Trees with mistletoe brooms or other features important for wildlife habitat
Organically derived patterns	Soil chemical, physical, microbial properties

Biological legacy category	Examples
	Forest understory composition and distribution

(Franklin et al. 2007)

FW-STD-VEG-09. Timber Harvest

Ensure that timber will be harvested from National Forest System lands only where soil, slope, or other watershed conditions will not be irreversibly damaged and where protection is provided for streams, stream-banks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperature, blockage of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat.

FW-DC-MIN-02. Reclamation and Extraction

Approved mining operations include concurrent, interim and post-operation reclamation measures to ensure the long-term function and stability of resources including, but not limited to, soil; vegetation; water quality; aquatic, riparian and upland habitats; and scenic integrity objectives.

MA-DC-ARS-01. Resource Conditions

Administrative and recreation sites are places where structures and human-caused vegetation changes may be seen but they do not dominate the view or attract attention. The scenic integrity objectives would range from low to moderate to high with seed tree orchards potentially being in the low range and in administrative or developed recreation sites in the moderate to high scenic integrity levels. Ecological conditions (including wildlife, aquatic, soil, and vegetation) and landscape appearances can be outside of their natural range. Human activities in the areas visible for administrative and recreation sites (foreground to middle ground, 300 feet to 4 miles) should not attract attention or stand out, and the landscapes should appear natural (moderate to high scenic integrity). Vegetation can be manipulated to accommodate occupancy and use, and to protect or enhance recreational opportunities.

MA-GDL-ARS-02. Resource Management Applicable Guidance

Forestwide desired conditions and design criteria for vegetation (with the exception of the Biological Legacies plan components for snags and coarse woody debris), water resources, riparian management areas, wildlife and soils should be implemented when making management decisions in administrative and recreation sites. These resource decisions should be integrated into the sustainable design of the site and allow for human health and safety and the full functionality of the site for human use and occupancy. Coarse woody debris may be retained or removed from a site when it contributes to, or interferes with, site design, delineation, or use.

MA-GDL-RMA-20. Wildland Fire and Fuels Management – Burning Masticated Fuels

To minimize soil damage when burning masticated fuels within RMAs, burning of masticated fuel beds greater than 3 inches in depth should be accomplished with moist soil conditions.

Table 39. Forest Plan Monitoring Questions

Resource	Monitoring question	Reference to Forest Plan direction	Indicator	Frequency of measure
Soil	MON-SOIL-01: To what extent have plan components prevented irreversible damage to soil conditions?	FW-DC-SOIL-01, FW-DC-SOIL-02; FW-OBJ-SOIL-01; FW-GDL-SOIL-01;	MON-SOIL-01-01: Number of harvest units surveyed and percent that meet the Regional Soil Quality Standard, post-harvest (FSM, R6 Supplement No. 2500.98-1)	Annual

PROPOSED MANAGEMENT ACTIONS

The objectives in chapter 2 of the plan represent projects or activities intended to be accomplished during the planning period. The timeframe for completing the objectives varies by objective. These are listed in the table below.

Table B-3. List of proposed management actions (plan objectives)

Category	Project/Activity	Timeframe to complete
Soil	Annually stabilize, rehabilitate, or restore natural processes that support soil productivity and function on 20 to 30 acres.	Within 5 years of plan implementation